SHAPE-CHANGING DISPLAY FOR A HANDHELD ELECTRONIC DEVICE

FIELD

[0002] The present disclosure, in a broad sense, is directed toward handheld electronic devices including those without communication capabilities such as Personal Digital Assistants (PDAs), and more specifically the disclosure is directed toward handheld communication devices that have wireless communication capabilities and the networks within which the wireless communication devices operate. Furthermore, the disclosure presents solutions regarding displays capable of facilitating user input on such devices.

BACKGROUND

[0003] With the proliferation of wireless communications systems, compatible handheld communication devices are becoming more prevalent, as well as advanced. Whereas in the past such handheld communication devices were typically limited to either voice transmission (cell phones) or text transmission (pagers and PDAs), today's consumer often demands a multi-functional device capable of performing both types of transmissions, including even sending and receiving e-mail. Furthermore, these higher-performance devices can also be capable of sending and receiving other types of data including that which allows the viewing and use of Internet websites. These higher level functionalities necessarily require greater user interaction with the devices through included user interfaces (UIs) which may have originally been designed to accommodate making and receiving telephone calls and sending messages over a related Short Messaging Service (SMS). As might be expected, suppliers of such mobile communication devices and the related service providers are anxious to meet these customer requirements, but the demands of these more advanced functionalities have in many circumstances rendered the traditional user interfaces unsatisfactory, a situation that has caused designers to have to improve the UIs through which users input information and control these sophisticated operations.

[0004] Additionally, the size of the display screen available on such devices has seen increasing attention. In order to maximize the size of the display screen on a device, it may be necessary to limit input devices located on the front surface of the device. Typically, this can involve reducing the size of a keyboard on the front surface or assembling the device in a clam-shell, slidable, or other multi-part configurations. Alternatively, a touch screen can be implemented such that the user of the device inputs information into the device using a stylus, the user's fingertip, or other object. The stylus interface or other touch screen input devices prevent the user from experiencing tactile feedback from activation of a portion of the display screen. This can lead the user to make mistakes in inputting data and/or become frustrated while trying to input the desired information.

[0005] The present disclosure provides solutions to these and other problems through the use of a shape-changing upper surface on an adaptive display screen that is capable of presenting visibly different key arrangements on the adaptive display screen.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Exemplary methods and arrangements conducted and configured according to the advantageous solutions presented herein are depicted in the accompanying drawings wherein:

[0007] FIG. **1** depicts a handheld communication device with an adaptive display screen cradled in the palm of a user's hand;

[0008] FIG. **2**A depicts a handheld communication device with an adaptive display screen showing both an alphabetic key arrangement and a navigational key arrangement;

[0009] FIG. **2**B depicts a handheld communication device with a phone key arrangement and a navigational key arrangement on an adaptive display screen;

[0010] FIG. **3**A depicts an example of a shape that the adaptive display screen can present to the operator;

[0011] FIG. **3**B depicts another example of a shape that the adaptive display screen can present to the operator;

[0012] FIG. **3**C depicts yet another example of a shape that the adaptive display screen can present to the operator;

[0013] FIG. **3**D depicts a solid shape adaptive surface in a flat configuration;

[0014] FIG. **4** illustrates an exemplary QWERTY keyboard layout;

[0015] FIG. **5** illustrates an exemplary QWERTZ keyboard layout;

[0016] FIG. **6** illustrates an exemplary AZERTY keyboard layout;

[0017] FIG. **7** illustrates an exemplary Dvorak keyboard layout;

[0018] FIG. **8** illustrates a QWERTY keyboard layout paired with a traditional ten-key keyboard;

[0019] FIG. **9** illustrates ten digits comprising the numerals 0-9 arranged in a telephone keypad configuration, including the * and # keys flanking the 0 key;

[0020] FIG. **10** illustrates a numeric phone key arrangement according to the ITU Standard E.161 including both numerals and letters;

[0021] FIG. **11** illustrates a full alphabetic key arrangement shown on the adaptive display screen of the handheld electronic device;

[0022] FIG. **12** illustrates a reduced alphabetic key arrangement and a navigational key arrangement on the adaptive display screen of the handheld electronic device;

[0023] FIG. **13** illustrates another example of a full alphabetic key arrangement on the adaptive display screen of the handheld electronic device;

[0024] FIG. **14** illustrates another example of a reduced alphabetic key arrangement on the adaptive display screen of the handheld electronic device;

[0025] FIG. **15** illustrates a phone key arrangement shown on the adaptive display screen of the handheld device with a physical keyboard;

[0026] FIG. **16** is a block diagram representing a wireless handheld communication device interacting in a communication network; and